

Growing Patterns: Practical Pattern Problems

Brief Overview:

These lessons are designed to enable students to describe, extend, create, and evaluate a growing pattern in order to predict future outcomes to a given scenario. They will work cooperatively to develop rules for various function tables. They will then use these concepts to solve a real world problem.

NCTM Content Standard

Algebra:

Understand patterns, relations, and functions

- Describe, extend, and make generalizations about geometric and numeric patterns
- Represent and analyze patterns and functions, using words, tables, and graphs

Represent and analyze mathematical situations and structures using algebraic symbols

- Represent the idea of a variable as an unknown quantity using a letter or symbol
- Express mathematical relationships using equations

Grade/Level:

Grades 4-5

Duration/Length:

Three Days (50 minutes each day)

Student Outcomes:

Students will:

- Describe, create, and extend patterns
- Create a function table based on growing patterns
- Use this information to solve a real world problem

Materials and Resources:

- Pattern Blocks
- Small cardboard box with slits on each side for the Output Machine
- Index cards
- Blank Transparencies
- Teacher Resources (1, 4, 8)
- Student Resources (2, 3, 5, 6, 7, 9, 10)

- Summative Assessment
- Answer Keys (1-5)

Development/Procedures:

Lesson 1 Evaluating Patterns

Preassessment—

- Begin the lesson with a class discussion of patterns. Pre-assess their ability to think about the differences between patterns. Wear an article of clothing that day that has some sort of pattern on it. Point it out to the students and ask them questions to initiate discussion. What pattern do you see on my shirt, pants, etc.? How do you know that it is a pattern? Where do we find patterns in our classroom, homes, school, neighborhood, students, etc.? Are there different kinds of patterns? Brainstorm these ideas and record them on the chalkboard.

Launch –

- Show a transparency (Resource Sheet 1) of various repeating and growing patterns. Hand this out to the students as a worksheet. Ask the students if they notice similarities and differences between the patterns. Look at the pattern in number 1. Invite students to predict the next 3 terms of the pattern. **Be sure that they understand that a term refers to the location of the objects in the pattern.**
- Instruct the students to continue the patterns on their worksheets for 3 additional terms. Provide pattern blocks so that students can visualize their answers more easily. Discuss the answers with the students. Explain that numbers 1 and 4 are repeating patterns, because they have a core of terms that constantly repeat. Numbers 2 and 3 are called growing patterns because their terms continue to change. Growing patterns are constantly changing, just like when we grow, we change in different ways.

Teacher Facilitation –

- Get 6 student volunteers to come up to the front of the room. Put 1 student in a group by himself or herself. Next, put 2 students into a group. Finally, put 3 students into a group. What do you notice about the different groups of students? Make a T chart on the chalkboard. At the top of the chart, labels the columns "Terms" and "# of students." Invite the students to come to the board and fill in the correct number of students next to each appropriate term. How do you get from 1 student in the first term to 2 students in the second term? Through this discussion, the students should be able to say that you need to add 1 student to each group for each new term. Extend the pattern for 3 more terms. Challenge the students to determine what the 10th term in the pattern will be.
- Next, invite 12 new students up to the front of the room. Organize these students into 1 group of 2 students, a 2nd group of 4 students, and a 3rd group of 6 students. Challenge the class to create a T chart based on this pattern. How did the number

increase in this pattern? Through discussion, show that students must add 2 to each term in order to proceed with the growing pattern.

Student Application –

- Distribute pattern blocks and Growing Patterns worksheets (Resource Sheet 2). Read and discuss the directions. Have students work with partners to complete the worksheet. Circulate around the room to observe the students and answer questions when needed. Answers may be found on Answer Key 1.
- For homework, the students should create 3 new growing patterns with 3 terms each.

Embedded Assessment –

- Review the worksheets with the students and complete the transparency of the worksheet. Distribute Exit Slip (Resource Sheet 3). The students will complete the exit slip after discussing their answers to the worksheet. Instruct the students to write 2-3 sentences about what they learned today: the differences between a repeating pattern and a growing pattern, where we find patterns in the real world, why patterns are important, etc.

Reteaching/Extension –

- Check for understanding with the class by reviewing the exit slips.
- Reteach: Make a chart of ideas that the students learned that day in class.
- Extension: Challenge the students to now begin to develop their own growing patterns using shapes, numbers, pictures, etc. After they have completed their patterns, they can switch with their neighbor to attempt to extend their patterns. The students should also be able to put the terms into a T chart and explain them.

Lesson 2 Forming Rules

Preassessment –

- Students will share their homework from the last evening and the class will extend the patterns by three more terms. The teacher will ask the students to describe how they were able to extend this pattern.

Launch –

- Teacher will ask two students to come and stand on either side of the Output Machine. Student 1 will write a number on the index card and put it into the slit in the machine (cardboard box with label on front—Resource Sheet 4). The teacher will write a new number on an index card (for example – this number times 2) and slide it out the other slit to student 2. Another student will write these numbers across from each other in a T chart on the board (for example 2, 4). This procedure will be repeated 3 more times. The teacher will ask the students why each input has only one output. Tell them that this is the rule, or description, of the pattern, such as “any number times 2”.

Teacher Facilitation –

- The teacher will make an input/output chart on the board and arrange the data in numerical order and write the rule in words beside the input/output chart. The teacher will then ask the students if they can write the rule as an equation. The teacher will then show the students that a variable can represent an unknown number. We can combine our rule and the variable to make an equation. For example, $2 \times \text{input} = \text{output}$. We can tell the students that the letter “n” can be used in place of the word “input” to represent “any number.”
- Now, we can add any number to the input side of our chart and be able to figure out the output using our equation. The teacher will write up more input numbers and ask for student responses for the output. The teacher will then ask for 2 new student volunteers to use the Output Machine again. This time the teacher will add 5 to the input number to get the output number (for example, input 3 – output 8). Another student will record these numbers on the board. The teacher will then lead the students to the rule and equation.
- This procedure will be repeated a few more times (depending on student understanding) to show many different types of equations, including $2n + 1$ etc. This procedure will also be demonstrated in reverse (giving the student the output and asking them to find the input and an equation that applies).

Student Application –

- Students will be put in pairs to work on Resource Sheet 5, which is an input/output worksheet. Answers may be found on Answer Key 2.
- For homework, the students will be given rules and asked to create an input/output chart and equation based on that rule (Student Resource Sheet 6). Answers may be found on Answer Key 3.

Embedded Assessment –

- The students will be asked to write a letter to students in another math class explaining to them how the Output Machine in their class works (Resource Sheet 7).

Reteaching/Extension –

- Reteach: The teacher will answer any questions that the students may have had on Resource Sheet 6 using a T chart.
- Extension: Students will be allowed to write down a rule that only the teacher sees and become the Output Machine operator. For example, a student could write down “times five” and then be the machine operator and change the cards using his/her own rule.

Lesson 3 Real World Problems

Preassessment –

- Review the previous night’s assignment and ask volunteers to share their charts with the class. Since there are 4 different questions on the worksheet, 4 different

students can put their charts on the chalkboard. **Make sure that the blank charts are on the board already at the start of the class.** Review any concepts from creating rules that appear difficult for the students.

Launch –

- Ask the students a question as a “think-pair-share” activity. Ask the question: Can you think of a time when you could use a function chart in the real world? Give students 2 minutes to think of ideas, and then have them join with a partner to share their ideas. After another minute or 2, ask the students to share their partner’s ideas. Use the brainstorming transparency (Resource Sheet 8) to record the students’ ideas. As they give their ideas, ask the students why using a chart would be helpful, how it could help them organize and plan, etc.

Teacher Facilitation –

- Form a real world problem based on one of the ideas given by the students. For example: Kevin wants to buy a bike that costs \$150. He wants to know how many weeks it will take him to earn the money, based on his allowance. Invite the students to give ideas for the amount of money that Kevin earns as an allowance per week. Use that amount to create a T chart on a blank transparency.
- Ask the students, how can you put into words how to find the output when you know the input? Using words, and then an equation, write a rule for finding output from a given input, and the input from a given output. Demonstrate for the students how to determine how long it is going to take Kevin to earn enough money to buy the bike. Show that you can extend the terms to find the amount of time, or you can more easily use the rules to find your answer. Explain that if Kevin only makes \$2 a week, then it would take a lot longer to extend the chart than it would be to use the rule.

Student Application –

- Instruct the students to find partners to complete 3 real-life word problems (Resource Sheet 9). Explain that they should complete the first 3 terms of the chart, in addition to the rules for each problem. Answers may be found on Answer Key 4.
- Review the word problems as a whole class by acting out the answers. The teacher can call on pairs of students to come to the front and illustrate their answers to the class by acting as the characters in the problems. They will show the class how they determined the amounts in the chart and how they figured out the rule for the problem.
- Give students the real world application word problems (Student Resource Sheet 10). Answers may be found on Answer Key 5. They can begin to work on them in class. Explain that for these, they must develop the charts and rules by themselves. They are not provided. Also, on the worksheet there is a section where the students can create their own word problems. This can be completed as an extension.

Embedded Assessment –

- Instruct the students to put their thumbs up, sideways, or down in order to show if the concept is easy, ok, or difficult. For those students whose thumbs are up, have them walk around and help those students who are not fully grasping the concept. Check for understanding again by asking a few different students to explain what they learned today.

Reteaching/Extension –

- Reteach: For students who are having trouble with the concept, form a small group and use the T chart transparency to work through the word problems.
- Extension: Students who finish their work early can form small groups to create and act out another scenario based on growing patterns.

Summative Assessment:

- We will use an assessment written in MSA format that encompasses all of the skills taught throughout the unit. It consists of pattern extensions, function tables, and real world word problems. As an extension on the assessment, students are invited to create their own real life word problem as well as solve the problem and explain their solution.

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Name: _____










Date: _____

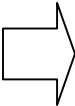
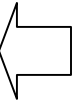
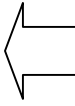
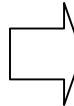
PATTERNS

Please copy and extend these patterns.

1) A B A B A _____

2)    _____

3)          _____

4)     _____

Name: _____

Date: _____

GROWING PATTERNS

DIRECTIONS – Extend the following patterns and complete the corresponding T chart.

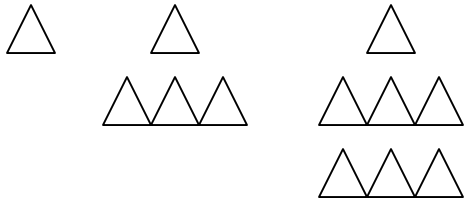
1) A AA AAA AAAA _____

[illegible]

2)   

[illegible]

3)

[illegible]

4) A AB ABC ABCD

TERM	# of Letters

5)

[illegible]

Name: _____

Date: _____

Exit Slip

Directions: Write 2-3 sentences about something that you learned today in class. Ideas can include the differences between a repeating pattern and a growing pattern, where we find patterns in the real world, why patterns are important, or anything significant that you learned today about patterns.



OUTPUT
MACHINE

Name: _____ Date: _____

What's the Rule?

Directions:

- Complete each table by filling in the missing numbers for either the input or the output.
- Use words to write a rule describing how to find the **output** when given the **input**. Write an equation using a variable (n) to show the rule.
- Use words to write a rule describing how to find the **input** when given the **output**. Write an equation using a variable (n) to show the rule.

1.

INPUT	OUTPUT
0	0
1	3
2	6
3	9
4	12
7	
10	
13	
16	
	60
	75
	90

RULES:

Input to Output: _____

Output to Input: _____

Input Equation: _____

Output Equation: _____

2.

INPUT	OUTPUT
0	0
1	5
2	10
3	15
5	
6	
8	
	50
	65
	75
	100

RULES:

Input to Output: _____

Output to Input: _____

Input Equation: _____

Output Equation: _____

3.

INPUT	OUTPUT
0	1
1	3
2	5
3	7
4	9
7	
9	
12	
	31
	37
	51
	61

RULES:

Input to Output: _____

Output to Input: _____

Input Equation: _____

Output Equation: _____

4.

INPUT	OUTPUT
0	2
1	5
2	8
3	11
4	14
6	
9	
10	
	35
	41
	62
	77

RULES:

Input to Output: _____

Output to Input: _____

Input Equation: _____

Output Equation: _____



Name: _____ Date: _____

Create-A-Chart

Directions: Use the given rules to fill in each chart. Feel free to start with any term, but then continue in numerical order after that.

.....

1.

INPUT	OUTPUT

RULES:

Input Equation: $n \times 4$

Output Equation: $\frac{n}{4}$

2.

INPUT	OUTPUT

RULES:

Input Equation: $2n + 3$

Output Equation: $\frac{(n - 3)}{2}$

3.

INPUT	OUTPUT

RULES:

Input Equation: $n \times 7$

Output Equation: $\frac{n}{7}$

4.

INPUT	OUTPUT

RULES:

Input Equation: $4n + 1$

Output Equation: $\frac{(n-1)}{4}$

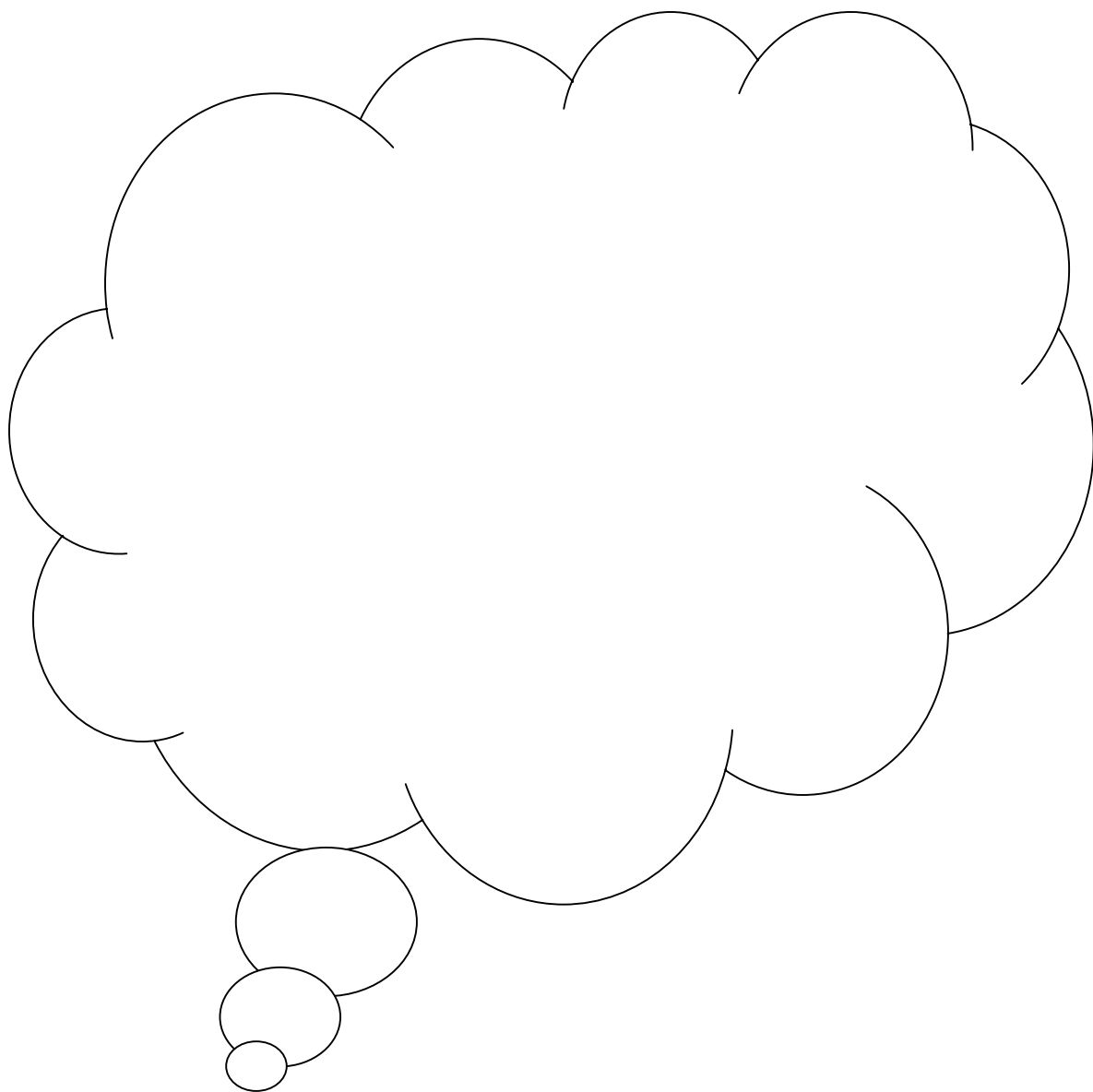


Input/Output Letter

DIRECTIONS – Write a letter to a student in another class explaining how the Output Machine in your class works. Be sure to include how this machine helped you to be able to extend and create function tables.

[illegible]

BRAINSTORM



Name: _____ Date: _____

USE WHAT YOU KNOW

Directions – Use what you know about patterns and input/output charts to help you solve these problems.

- 1) Raven wants to go to the BowWow concert. Her mother said that she has to save enough money for her own ticket. The tickets cost \$40.00. Raven earns \$8.00 a week for allowance. How long will it take for Raven to save enough money for the BowWow ticket?

Week	Money Saved

Rules
Input to Output _____

Output to Input _____

Input Equation _____
Output Equation _____

Answer _____

- 2) Raven had an accident. She broke her mother's good lamp. Her mother said that she has to pay her back the \$200.00 for the lamp before she pays for the ticket. Now Raven has to save \$240.00 before going to the concert. She still only makes \$8.00 a week. How long will it take her to save for the concert.

Week	Money Saved

Rules
Input to Output_____

Output to Input_____

Input Equation_____
Output Equation_____

Answer_____

3. Raven liked the concert so much that she decided that she wanted to go see BowWow again. He does not appear in Baltimore again for 6 years. The nearest place that he performs this year is Richmond, Virginia. Raven’s mother says that she can go, but she has to pay for the motel room in Richmond also. The motel cost \$120.00 a night. The price of the ticket is still \$40.00. Raven now makes \$9.00 a week. How long will it take for Raven to save for Richmond BowWow concert?

Week	Money Saved

Rules
Input to Output_____

Output to Input_____

Input Equation_____
Output Equation_____

Answer_____

Name: _____ Date: _____

The Real World

Directions: Create a chart for each problem and determine the rule for the chart. Use this information to solve each problem.

.....

1. As a back to school surprise, Tyler's mom bought him an album for his Yugo cards. He can't wait to fill it up! The album can hold 258 cards. With his leftover lunch money, Tyler is able to buy 3 cards every day, even on weekends. He starts buying cards on September 1. How many cards will Tyler have after the month of September? Will he have all of his cards by December? How do you know? _____



2. For his summer job, Josh is going to cut lawns in his neighborhood. He can only cut one big yard a day, so he charges \$30 per day. For her summer job, Anna is going to work at the snowball stand in her neighborhood. She earns \$45 each day, but she spends \$2 of that money each day to get lunch. Both of the kids want to use their summer money to buy a new stereo system. The system costs \$800!! If the 2 kids work every day of the summer, then who will be able to buy the system first? How much longer will it take the other child to buy the system? _____



3. Emma is just starting to walk!! Every day, she takes more steps than she did the day before. On the first day, she takes 3 steps and then falls down. The following day, Emma takes 5 steps and then sits down. On the third day, she is able to take 7 steps, but then she falls asleep for the rest of the day. How many steps will Emma be able to take after 25 days if she follows the same pattern? How long will it take for her to take 101 steps?

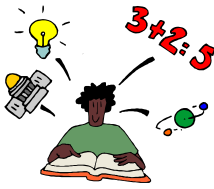


4. Justin Timberpond, the newest singer in town, has concerts at Ravens Stadium every year. In his 1st year, only 28 people came!! In his 2nd year, 53 fans showed up to hear him. In his 3rd year, 78 groupies came to listen to him. If this pattern continues, how long will it take until there are 253 fans at the stadium rocking to Justin's music? If Justin only sings for 7 years, how many people will come to see him?



Name: _____

Date: _____



SUMMATIVE ASSESSMENT

PART 1 – COPY AND EXTEND THE PATTERN

1) 9 18 27 36 ____ _ _ _

Ⓐ 45 54 73 88

Ⓑ 9 13 36 22

Ⓒ 45 54 63 72

Ⓓ 63 72 55 38

2) 5 10 15 20 ____ _ _ _

Ⓐ 25 30 35 40

Ⓑ 10 20 30 40

Ⓒ 12 13 22 44

Ⓓ 25 35 45 55

3) 1 2 4 7 ____ _ _ _

Ⓐ 5 7 11 13

Ⓑ 11 16 22 29

Ⓒ 10 13 20 27

Ⓒ 11 17 22 39




4) 90 80 70 60 _____

Ⓐ 70 80 90 100

Ⓑ 50 40 30 20

Ⓒ 3 33 44 55

Ⓓ 50 30 20 10

5)    _____

Ⓐ   

Ⓑ   

Ⓒ   

Ⓓ   

PART 2 - FILL OUT THE INPUT/OUTPUT CHART and FILL IN THE RULE BOX

A. Complete the function table below.

INPUT	OUTPUT
3	8
4	9
5	

B. Use what you know about function tables to explain why your answers are correct.
Use words and/or numbers in your explanation.

A. Write the rule that this function table follows.

Answer _____

INPUT	OUTPUT
2	4
4	8
6	12
8	16
10	20
12	24
14	28

B. Use what you know about function tables to explain why your answers are correct.
Use words and/or numbers in your explanation.

PART 3 – USE WHAT YOU KNOW/WORD PROBLEMS

Part A.

1) Andy is trying to make the track team at school this year. He needs to be able to run for 100 yards without stopping. Unfortunately, Andy has been very lazy and eating a lot of candy bars this summer and is out of shape. On his first try Andy was only able to run for 9 yards without stopping. He has a goal of adding 2 more yards each day (even weekends). If he achieves his goal each day, how long will it take Andy to make the track team? _____



B. Use what you know about function tables to explain why your answer is correct. Use words and/or numbers in your explanation.

Part A.

2) Jasmine wants to buy a new pair of shoes for the dance. She already has \$10.00 dollars saved. The shoes cost \$85.00. Jasmine earns \$5.00 a week for allowance. How long will it take her to buy the shoes? _____



B Use what you know about function tables to explain why your answer is correct. Use words and/or numbers in your explanation.

CHALLENGE – EXTRA CREDIT







Create your own word problem that can be solved using a pattern or input/output chart.
Solve the problem and explain how you solved it.

GROWING PATTERNS

DIRECTIONS – Extend the following patterns and fill out the corresponding T chart.

1) A AA AAA AAAA AAAAA AAAAAA
AAAAAAA

TERM	# of A's
1	1
2	2
3	3
4	4
5	5
6	6
7	7

2)    
 

TERM	# of Heart's
1	1
2	3
3	5
4	7
5	9
6	11

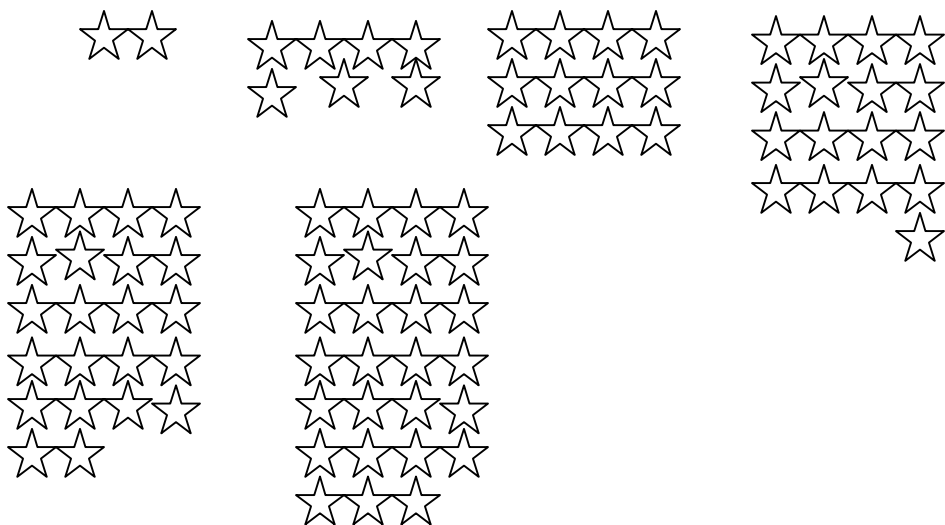
3)

TERM	# of Triangles
1	1
2	4
3	7
4	10
5	13
6	16

4) A AB ABC ABCD ABCDE ABCDEF ABCDEFG

TERM	# of Letters
1	1
2	2
3	3
4	4
5	5
6	6
7	7

5)



TERM	# of Stars
1	2
2	7
3	12
4	17
5	22
6	27

What's the Rule?

Directions:

- Complete each table by filling in the missing numbers for either the input or the output.
- Use words to write a rule describing how to find the **output** when given the **input**. Write an equation using a variable (n) to show the rule.
- Use words to write a rule describing how to find the **input** when given the **output**. Write an equation using a variable (n) to show the rule.

1.

INPUT	OUTPUT
0	0
1	3
2	6
3	9
4	12
7	21
10	30
13	39
16	48
20	60
25	75
30	90

RULES:

Input to Output: Multiply by 3

Output to Input: Divide by 3

Input Equation: $n \times 3$

Output Equation: $n / 3$

2.

INPUT	OUTPUT
0	0
1	5
2	10
3	15
5	25
6	30
8	40
10	50
13	65
15	75
20	100

RULES:

Input to Output: Multiply by 5

Output to Input: Divide by 5

Input Equation: $n \times 5$

Output Equation: $n / 5$

3.

INPUT	OUTPUT
0	1
1	3
2	5
3	7
4	9
7	15
9	19
12	25
15	31
18	37
25	51
30	61

RULES:

Input to Output: Multiply by 2, then add 1

Output to Input: Subtract 1, then divide by 2

Input Equation: $2n + 1$

Output Equation: $(n - 1) / 2$

4.

INPUT	OUTPUT
0	2
1	5
2	8
3	11
4	14
6	20
9	29
10	32
11	35
13	41
20	62
25	77

RULES:

Input to Output: Multiply by 3, then add 2

Output to Input: Subtract 2, then divide by 3

Input Equation: $3n + 2$

Output Equation: $(n - 2) / 3$



Create-A-Chart

Directions: Use the given rules to fill in each chart. Feel free to start with any term, but then continue in numerical order after that.

1.

INPUT	OUTPUT
1	4
2	8
3	12
4	16
5	20
6	24
7	28
8	32
9	36
10	40
11	44
12	48

RULES:

Input Equation: $n \times 4$

Output Equation: $\frac{n}{4}$

2.

INPUT	OUTPUT
1	5
2	7
3	9
4	11
5	13
6	15
7	17
8	19
9	21
10	23
11	25
12	27

RULES:

Input Equation: $2n + 3$

Output Equation: $\frac{(n - 3)}{2}$

3.

INPUT	OUTPUT
1	7
2	14
3	21
4	28
5	35
6	42
7	49
8	56
9	63
10	70
11	77
12	84

RULES:

Input Equation: $n \times 7$

Output Equation: $\frac{n}{7}$

4.

INPUT	OUTPUT
1	5
2	9
3	13
4	17
5	21
6	25
7	29
8	33
9	37
10	41
11	45
12	49

RULES:

Input Equation: $4n + 1$

Output Equation: $\frac{(n-1)}{4}$



USE WHAT YOU KNOW

Directions – Use what you know about patterns and input/output charts to help you solve these problems.

- 3) Raven wants to go to the BowWow concert. Her mother said that she has to save enough money for her own ticket. The tickets cost \$40.00. Raven earns \$8.00 a week for allowance. How long will it take for Raven to save enough money for the BowWow ticket?

Week	Money Saved
1	8
2	16
3	24
4	32
5	40
6	48

Rules

Input to Output: Multiply by 8

Output to Input: Divide by 8

Input Equation: $n \times 8$

Output Equation: $n \div 8$

Answer: $\$40.00 \div 8 = \underline{\mathbf{5 \text{ weeks}}}$

- 4) Raven had an accident. She broke her mother's good lamp. Her mother said that she has to pay her back the \$200.00 for the lamp before she pays for the ticket. Now Raven has to save \$240.00 before going to the concert. She still only makes \$8.00 a week. How long will it take her to save for the concert.

Week	Money Saved

<p align="center">Rules: SAME</p> <p>Input to Output_____</p> <p>_____</p> <p>Output to Input_____</p> <p>_____</p> <p>Input Equation_____</p> <p>Output Equation_____</p>

Answer: $\$240.00 / 8 = \underline{30 \text{ weeks}}$

3. Raven liked the concert so much that she decided that she wanted to go see BowWow again. He does not appear in Baltimore again for 6 years. The nearest place that he performs this year is Richmond, Virginia. Raven’s mother says that she can go, but she has to pay for the motel room in Richmond also. The motel cost \$120.00 a night. The price of the ticket is still \$40.00. Raven now makes \$9.00 a week. How long will it take for Raven to save for Richmond BowWow concert?

Week	Money Saved
1	9
2	18
3	27
4	36
5	45
6	54

<p align="center">Rules</p> <p>Input to Output: Multiply by 9</p> <p>Output to Input: Divide by 9</p> <p>Input Equation: $n \times 9$</p> <p>Output Equation: $n / 9$</p>
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Answer: $\$120.00 + \$40.00 = \$180.00$
 $\$180.00 / 9 = \underline{\mathbf{20 \text{ weeks}}}$

The Real World

Directions: Create a chart for each problem and determine the rule for the chart. Use this information to solve each problem.

1. As a back to school surprise, Tyler's mom bought him an album for his Yugo cards. He can't wait to fill it up! The album can hold 258 cards. With



his leftover lunch money, Tyler is able to buy 3 cards every day, even on weekends. He starts buying cards on September

1. How many cards will Tyler have after the month of September? Will he have all of his cards by December? How do you know? **After the month of September, Tyler will**

have 90 Yugo cards. Yes, he will have all of his cards by December—he will have them in the middle of November. 86 days from September 1 is November 25.

Term	# Cards
1	3
2	6
3	9

Rule: $n \times 3$

$258 / 3 = 86$ days

2. For his summer job, Josh is going to cut lawns in his neighborhood. He can only cut one big yard a day, so he charges \$30 per day. For her summer job, Anna is going to work at the snowball stand in her neighborhood. She earns \$45 each day, but she spends \$2 of that money each day to get lunch. Both of the kids want to use their summer money to buy a new stereo system. The system costs \$800!! If the 2 kids work every day of the summer, then who will be able to buy the system first? How much longer will it take the other child to buy the system?



Josh: $\$800 / \$30 = 27$ days

Anna: $\$800 / \$43 = 19$ days

Anna can buy the system first. It will take Josh 8 extra days to buy the system.

3. Emma is just starting to walk!! Every day, she takes more steps than she did the day before. On the first day, she takes 3 steps and then falls down. The following day, Emma takes 5 steps and then sits down. On the third day, she is able to take 7 steps, but then she falls asleep for the rest of the day. How many steps will Emma be able to take after 25 days? How long will it take for her to take 101 steps?



Term	# Steps
1	3
2	5
3	7

After 25 Days: 51 steps
It will take her 50 days to take 101 steps.

4. Justin Timberpond, the newest singer in town, has concerts at Ravens Stadium every year. In his 1st year, only 28 people came!! In his 2nd year, 53 fans showed up to hear him. In his 3rd year, 78 groupies came to listen to him. If this pattern continues, how long will it take until there are 253 fans at the stadium rocking to Justin's music? If Justin only sings for 7 years, how many people will come to see him?



Term	# fans
1	28
2	53
3	78

It will take 10 years for there to be 253 fans.
In his 7th year, 178 fans will come to the concert.



SUMMATIVE ASSESSMENT

PART 1 – COPY AND EXTEND THE PATTERN

1) 9 18 27 36 _____

(A) 45 54 73 88

(B) 9 13 36 22

ANSWER: C

(C) 45 54 63 72

(D) 63 72 55 38

2) 5 10 15 20 _____

(A) 25 30 35 40

(B) 10 20 30 40

ANSWER: A

(C) 12 13 22 44

(D) 25 35 45 55

3) 1 2 4 7 _____

(A) 5 7 11 13

(B) 11 16 22 29

ANSWER: B

(C) 10 13 20 27

(D) 11 17 22 39




4) 90 80 70 60 _____

Ⓐ 70 80 90 100

Ⓑ 50 40 30 20 ANSWER: B

Ⓒ 3 33 44 55

Ⓓ 50 30 20 10

5)   

Ⓐ   

Ⓑ   

ANSWER: B

Ⓒ   

Ⓓ   

PART 2 - FILL OUT THE INPUT/OUTPUT CHART and FILL IN THE RULE BOX

A. Complete the function table below.

INPUT	OUTPUT
3	8
4	9
5	10
6	11
7	12
8	13
9	14
10	15
11	16
12	17

B. Use what you know about function tables to explain why your answers are correct.
Use words and/or numbers in your explanation.

Answers will vary

A. Write the rule that this function table follows.

Answer _____ Multiply the input by 2

INPUT	OUTPUT
2	4
4	8
6	12
8	16
10	20
12	24
14	28

B. Use what you know about function tables to explain why your answers are correct.
Use words and/or numbers in your explanation.

Answers will vary

PART 3 – USE WHAT YOU KNOW/WORD PROBLEMS

Part A.

1) Andy is trying to make the track team at school this year. He needs to be able to run for 100 yards without stopping. Unfortunately, Andy has been very lazy and eating a lot of candy bars this summer and is out of shape. On his first try Andy was only able to run for 9 yards without stopping. He has a goal of adding 2 more yards each day (even weekends). If he achieves his goal each day, how long will it take Andy to make the track team? _____ 46 days _____



B. Use what you know about function tables to explain why your answer is correct. Use words and/or numbers in your explanation.

_____ Answers will vary _____

Part A.

3) Jasmine wants to buy a new pair of shoes for the dance. She already has 10.00 dollars saved. The shoes cost \$85.00. Jasmine earns \$5.00 a week for allowance. How long will it take her to buy the shoes? _____



_____ 15 weeks _____

B Use what you know about function tables to explain why your answer is correct. Use words and/or numbers in your explanation.

_____ Answers will vary _____

CHALLENGE – EXTRA CREDIT

Create your own word problem that can be solved using a pattern or input/output chart.
Solve the problem and explain how you solved it.